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ABSTRACT

A seven-step procedure was developed to improve the intelligibility of children with significant motor problems (such as cerebral palsy). The procedure employs delayed auditory feedback to help the children control their rate of speaking to make it commensurate with their motor abilities. The procedure was pilot-tested with six children. Results revealed that the intensity as well as the time constraints imposed by the paradigm were not of significant benefit to the child. A revised format emphasized transfer of skills to situations outside the therapy room. At the close of therapy, two children were found to have improved their speech-sound productions. (CL)

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USE OF DELAYED AUDITORY FEEDBACK WITH MOTORICALLY INVOLVED CHILDREN

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A number of motorically involved children seen at the University of Nebraska Medical Center Clinic were observed to attempt speaking at a rate faster than that prudent for their articulation and breath control abilities. Reportedly, DAF had been used to control the rate of speaking as well as speech fluency (via continuous phonation) in rhythm disorders not associated with motor problems (Shames and Florance, 1980). In addition, a report in the literature indicated that improved speech intelligibility had been achieved with DAF by an adult with motor problems (Hanson and Metter, 1980). It was felt that DAF, similarly, could assist motorically involved children in gaining greater control over rate as well as phonation.

A seven-step program was developed in an attempt to improve the intelligibility of children displaying significant motor problems (e.g., cerebral palsy). The program made use of delayed auditory feedback (DAF) to assist the children in controlling their rate of speaking so that it was commensurate with their motor abilities.

Procedure

Step 1: Finding the DAF Base Rate

Explain the function of the DAF machine. Begin with the DAF at 140 msec. delay, increasing or decreasing as necessary.

Establish the slowest, most comfortable level at which child can maintain continuous phonation for two-syllable combinations.

Step 2: Continuous Phonation Using the DAF

With the DAF set at base rate, practice continuous phonation for a minimum of two-syllable combinations.

Gradually increase number of syllables per breath and establish comfortable use of base rate with DAF.

Remove DAF and have child self-monitor to maintain rate and continuous phonation.

If child is unable to produce two syllables per breath, do breathing work before continuing.

Step 3: Use of the Base Rate Without the DAF

Remove DAF and practice base rate until child can maintain it with only a model from the adult.
Instruct child to continue to use base rate while the adult speaks at a normal rate.
Allow frequent breaks when child and adult can speak at any rate desired.

Step 4: Addition of Intonation

Explain and give examples of monotone, normal, and exaggerated intonation.
With DAF set at base rate, have child maintain appropriate rate, continuous phonation, and proper intonation.
Remove DAF and practice base rate and intonation until child can maintain it with only a model from the adult.
Instruct child to continue to use base rate and appropriate intonation while adult speaks at a normal rate.

Step 5: Correct Articulation Plus Base Rate

Determine phonemes child produces accurately with stimulation, but not in conversational speech and explain which phonemes he is to self-monitor.
With the DAF set at the base rate, practice correct articulation of target phonemes in combination with slow rate.
Add new target phonemes as the child masters slow rate and previous target phonemes.
When the child has mastered one or a few phonemes, use those phonemes to begin work on Step 6.

Step 6: Adding Steps 4 and 5:

With the DAF set at the base rate, practice slow rate, intonation, and correct articulation.
Remove DAF and practice slow rate, intonation, and correct articulation until child can maintain it with only a model from the adult.
Instruct child to continue to use base rate, appropriate intonation, and correct articulation while the adult speaks at a normal rate.
Devise contracts for using these skills in situations other than the therapy setting and instruct the child to self-monitor and self-rate his performance.
Have the child monitor one element initially, and increase to monitoring all three elements.
Gradually decrease the use of the contracts, periodically monitoring the child's speech.

Step 7: Exceptions to the Rule

If there is a breakdown in rate at any point, return to the previous step.

Steps 4 and 5 are interchangeable. If the child automatically adds intonation or articulation, he may not need to work through Steps 4 or 5.

Some children may not be able to transfer these skills to an automatic level and should be given practice using these skills in selected situations only.

Some children may be able to increase the base rate somewhat. For these children, work through the program again, using a shorter delay to establish the fastest speaking rate that remains intelligible.

A total of six children, who ranged in motor involvement from mild to moderately-severe, were involved in the pilot therapy program. Presently, three of these children have been followed for a sufficient length of time to permit reasonable data collection on therapy performance.

In an intensive therapy program, one of these children (K.N.) was taken through the treatment paradigm. The child's local speech-language pathologist was trained to continue the program throughout the school year. It was found that the child could use a controlled manner of speaking in selected settings; however, it took too much effort to do so in all speaking situations. Additionally, the child's speech production was analyzed for fundamental frequency to examine pitch changes which may have occurred during the course of the therapy program. As revealed in Table 1, there were not observable differences in the child's pitch which were considered significant.

TABLE 1 FUNDAMENTAL FREQUENCY CHARACTERISTICS FOR CHILD K.N. SAMPLED DURING THE COURSE OF THE THERAPY PROGRAM.

SUBJECT - K.N.	AVERAGE FUNDAMENTAL FREQUENCY (HZ)	RANGE OF FUNDAMENTAL FREQUENCY (HZ)
PRE-THERAPY	249.5	228.4 - 254.6
250 MS. DELAY	239.0	203.2 - 301.6
200 MS. DELAY	212.4	194.8 - 243.4
150 MS. DELAY	233.3	213.4 - 251.6
100 MS. DELAY	247.2	211.6 - 294.8
50 MS. DELAY	226.9	211.6 - 245.2
POST-THERAPY	254.9	226.6 - 335.2

DATE - TIME 	ACTIVITY <i>taking turns</i>
COMMENTS: 	COMMENTS: <i>feeding birds</i>
PEOPLE 	breathing
COMMENTS: 	articulation
PLACE 	intonation
COMMENTS: 	tone
QUALITY 	COMMENTS:

The results of the therapy program for K.N. indicated that the intensity as well as the time constraints imposed by the paradigm were not of significant benefit to the child. For these reasons, a revised format was developed which involved an extended summer and Fall-Saturday therapy program for other children. This new format emphasized the use of contract sheets (see Figure 1) to transfer the skills taught in therapy to situations outside the therapy room.

The focus of the contracts was to place the responsibility of good speaking behavior on the child. The child was taught to consider the time, location, activity and individual he/she was speaking with, while monitoring the quality, rate, intonation, articulation, or breathing patterns of his/her speech productions.

The overall performance of three of the children examined in this program are shown on Table 2.

TABLE 2 INDIVIDUAL AND GROUP SPEECH INTELLIGIBILITY RATINGS AT PRE-THERAPY AND POST THERAPY INTERVALS. RATING SCALE: 0 (UNINTELLIGIBLE) TO 6 (VERY INTELLIGIBLE).

SUBJECT	PRE-THERAPY		POST-THERAPY	
	MEAN	RANGE	MEAN	RANGE
K.N.	2.2	1.0 - 3.0	1.9	0.0 - 3.0
D.T.	4.6	3.0 - 6.0	5.6	5.0 - 6.0
K.V.	2.7	1.0 - 4.0	3.1	2.0 - 5.0
GROUP AVERAGE	3.0	1.0 - 6.0	3.4	1.0 - 6.0

The intelligibility ratings of the children were based on listener-understanding of collected videotapes. A total of four certified speech-language pathologists and/or graduate students judged the pre- and post-therapy videotapes. As shown in Table 2, two of the three children were found to have improved their speech-sound productions at the close of the program. Child, K.N., who was the most motorically involved of the three children, was shown to slightly decrease in intelligibility at the close of therapy.

It was of interest to note that all of our children had to exit from the structured DAF set-up into a breathing program. The children were only able to prolong one syllable per exhalation, which made "continuous phonation" difficult to accomplish. In the breathing program, the children were taught via non-intrusive means (i.e., flute recorders, sustained phonation, etc), to sustain their exhalations for greater periods of time. Once this technique was mastered, the children were able to combine two, three, or more syllables per breathing cycle.

This study is ongoing. Further study is needed to determine if the DAF is a useful tool in increasing the intelligibility of motorically involved children. Further study is needed to look into length and intensity of therapy programs as a factor in determining success. Also, what role the breathing work plays in improvement of skills.